

Executive Proposed

2006 KING COUNTY FLOOD HAZARD MANAGEMENT PLAN

King County, Washington

May 2006

Prepared for



King County

Department of Natural Resources and Parks
Water and Land Resources Division
Regional Services Section

River and Floodplain Management Unit

King Street Center, KSC-NR-0600
201 South Jackson Street, Suite 600
Seattle, WA 98104-3855
206-296-6519 TTY Relay: 711
<http://dnr.metrokc.gov/wlr/flood/fhrpupdate.htm>

File Name: G:\RP\FHRP Update\April 05 and Beyond\May Executive Proposed Plan

Alternate Formats Available
206-296-6519 TTY Relay: 711

SPECIAL ACKNOWLEDGEMENTS

The Water and Land Resources Division thanks members of the Citizen's Advisory Committee, who provided invaluable knowledge, personal experience, support, and advice in preparation of this plan. The success this plan achieves will be due in large part to the good ideas, suggestions and guidance they provided County staff during many lengthy meetings. We thank the following member for their help.

| | |
|------------------------|--|
| Joseph Herr (Chair) | Floodplain Property Owner, Cedar River, Recreational Boater and Angler |
| John King (Vice Chair) | Flood Specialist for FM Global, an Industrial Property Insurer For Businesses Located in Floodplains |
| Candace Beardslee | Board Member of Washington Trout, Non-Profit Organization |
| Leonard Carlson | Floodplain Property Owner, Lower Snoqualmie River |
| Lisa Danielski | Wetland Biologist/Botanist |
| James Gessford | Civil Engineer, Water Resources Engineering |
| Debi Heiden | Regional Director for the Association of State Floodplain Managers, Certified Floodplain Manager, White River |
| Randy LaVigne | Floodplain Property Owner, Cedar River |
| James McBride | Floodplain Property Owner, Lower Snoqualmie River |
| Pam Pederson | Floodplain Property Owner, Burns Creek |
| Joel Roalkvan | Floodplain Property Owner, Upper Snoqualmie River |
| Robert Seana | Floodplain Property Owner, Lower Snoqualmie River |
| Brian Winslow | Major Industry Representative, The Boeing Company, Cedar River and Green River |

The Division would like to also thank Friends of Issaquah Salmon Hatchery for use of the Watershed Science Building for the Citizen's Advisory Committee meetings.

Finally, the Division would like to thank the representatives of other agencies and jurisdictions who generously gave their time and expertise during preparation of this plan.

For comments or questions on this document contact:

Steve Bleifuhs, Managing Supervisor
River and Floodplain Management Unit
Regional Services Section
Water and Land Resources Division
Department of Natural Resources and Parks
201 South Jackson Street, Room 600
Seattle, WA 98104-3855

This document should be cited as:

King County, 2006. *Flood Hazard Management Plan: King County, Washington*. King County
Department of Natural Resources and Parks, Water and Land Resources Division, Seattle, Washington.

King County Executive

Ron Sims

King County Council

Bob Ferguson, District 1

Larry Gossett, District 2

Kathy Lambert, District 3

Larry Phillips, District 4

Julia Patterson, District 5

Jane Hague, District 6

Pete von Reichbauer, District 7

Dow Constantine, District 8

Reagan Dunn, District 9

Department of Natural Resources and Parks

Pam Bissonnette, Director

Bob Burns, Deputy Director

Water and Land Resources Division

Mark Isaacson, Director

Joanna Richey, Assistant Director

Sandy Kilroy, Manager, Regional Services Section

River and Floodplain Management Program Contributing Staff

Tom Bean, P.E., Engineer III

Steve Bleifuhs, Managing Supervisor

Terry Butler, P.E., L.G., Geologist

Nancy Faegenburg, Project/Program Manager III

Heidi Kandathil, Engineer I

Priscilla Kaufmann, Project/Program Manager III

Jennifer Knauer, Project/Program Manager III

John Koon, Engineer II

Andy Levesque, Engineer III

Deborah Scheibner, P.E., Engineer II

Jeanne Stypula, P.E., Engineer IV

Ken Zweig, Project/Program Manager III

Water and Land Resources Division Contributing Staff

Dave Clark, Manager (retired), Flood Hazard Reduction Services

Claire Dyckman, Project/Program Manager III

Wendy Gable Collins, Graphic Designer and Cartographer

Gino Lucchetti, Senior Ecologist

Laurel Preston, Graphic Designer

Ruth Schaefer, Senior Ecologist

This plan was prepared with funding assistance from the state Flood Control Assistance Account Program, administered by the Washington State Department of Ecology

TABLE OF CONTENTS

| | Page Number |
|--|-------------|
| EXECUTIVE SUMMARY..... | I |
| CHAPTER 1 INTRODUCTION..... | 1 |
| 1.1 Purpose..... | 1 |
| 1.2 Goals and Objectives..... | 1 |
| 1.3 Guiding Principles..... | 3 |
| 1.4 Geographic Scope..... | 5 |
| 1.5 King County’s Planning Authority and Framework..... | 6 |
| 1.6 Planning Process..... | 6 |
| 1.7 Future Updates..... | 7 |
| CHAPTER 2 POLICIES..... | 11 |
| 2.1 General Policies..... | 11 |
| 2.2 Floodplain Land Use Policies..... | 15 |
| 2.3 Structural and Non-Structural Project Policies..... | 17 |
| 2.4 River Channel Maintenance Policies..... | 20 |
| 2.5 Flood Warning and Emergency Response Policies..... | 22 |
| 2.6 Funding Policies..... | 23 |
| CHAPTER 3 FLOODING IN KING COUNTY..... | 25 |
| 3.1 The Floodplain Landscape in King County..... | 25 |
| 3.2 Costs and Impacts of Flooding in King County..... | 26 |
| 3.3 Floodplain Management Practices in King County..... | 30 |
| 3.4 King County and the Community Rating System..... | 32 |
| CHAPTER 4 FLOOD RISK REDUCTION STRATEGIES AND TOOLS..... | 35 |
| 4.1 Developing Flood Hazard Information..... | 35 |
| 4.2 Management of Land Uses..... | 51 |
| 4.3 River Channel Maintenance..... | 60 |
| 4.4 Flood Protection Infrastructure..... | 68 |
| 4.5 Flood Hazard Education and Flood Season Preparedness, Flood Warning and Emergency Response..... | 84 |
| CHAPTER 5 BASIN SPECIFIC CHARACTERISTICS, STRATEGIES AND ACTION PLAN..... | 93 |
| 5.1 Countywide Projects and Programs..... | 95 |
| 5.2 South Fork Skykomish River..... | 99 |
| 5.3 Upper Snoqualmie River..... | 113 |

| | |
|--|------------|
| 5.4 Lower Snoqualmie River..... | 127 |
| 5.5 Tolt River..... | 143 |
| 5.6 Raging River..... | 161 |
| 5.7 Sammamish River..... | 175 |
| 5.8 Cedar River..... | 189 |
| 5.9 Green River..... | 225 |
| 5.10 White River..... | 273 |
| CHAPTER 6 IMPLEMENTATION AND STRATEGY | 301 |
| 6.1 King County's Role..... | 301 |
| 6.2 Coordination and Partnerships..... | 302 |
| 6.3 Adaptive Management..... | 305 |
| 6.4 Climate Change and Major River Flooding..... | 306 |
| 6.5 Recommendations..... | 306 |
| CHAPTER 7 FUNDING | 309 |
| 7.1 Local Funding Dedicated for Flood Risk Reduction..... | 309 |
| 7.2 Plan Implementation and Action Plan Funding..... | 316 |
| 7.3 Potential New and Enhance Local Funding Options..... | 320 |
| 7.4 Local, State and Federal Partnerships..... | 326 |
| 7.5 Conclusion and Recommendation..... | 337 |
| REFERENCES | |
| GLOSSARY | |
| APPENDICES | |
| Appendix A National Flood Insurance Program/CRS Activity 510 Crosswalk | |
| Appendix B Floodplain Management Regulations | |
| Appendix C King County Flood Risk Assessment | |
| Appendix D Accomplishments Since 1993 | |
| Appendix E King County Flood Protection Facilities | |
| Appendix F Action Plan | |
| Appendix G Flood Hazard Management Risk Areas, Management Needs and Projects | |

LIST OF MAPS

| | Page Number |
|---|-------------|
| Map 1-1 Geographic Scope of Flood Hazard Management Plan..... | 9 |
| Map 5-1 South Fork Skykomish River..... | 101 |
| Map 5-2 Upper Snoqualmie River..... | 115 |
| Map 5-3 Lower Snoqualmie River..... | 129 |
| Map 5-4 Tolt River..... | 145 |
| Map 5-5 Raging River..... | 163 |
| Map 5-6 Sammamish River..... | 177 |
| Map 5-7 Cedar River..... | 191 |
| Map 5-8 Green River..... | 227 |
| Map 5-9 White River..... | 275 |

LIST OF TABLES

| | Page Number |
|--|-------------|
| Table 3-1 Land and Structures Located in Mapped 100-Year Floodplains in King County..... | 27 |
| Table 3-2 2005 Repetitive Loss Properties In King County, WA..... | 28 |
| Table 3-3 Federally Declared Flood Disasters In King County (1990 to 2006): Damage To Publicly Owned Property..... | 30 |
| Table 3-4 Federally Declared Flood Disasters In King County (1990 to 2006): Local, State and Federal Cost Share (To Repair Damaged Public Property)..... | 30 |
| Table 4-1 Flood Studies Completed by King County Since 1993..... | 41 |
| Table 4-2 Flood Hazard Corridor Working Map Reaches and Data Availability for King County Rivers..... | 49 |
| Table 5-1 Proposed Countywide Programs and Costs (2007-2016)..... | 95 |
| Table 5-2 Proposed Countywide Projects and Costs (2007-2016)..... | 97 |
| Table 5-3 South Fork Skykomish River Flows..... | 100 |
| Table 5-4 Proposed Actions and Cost Estimates (2007-2016) for South Fork Skykomish River in King County..... | 106 |
| Table 5-5 Upper Snoqualmie River Flows..... | 114 |
| Table 5-6 Proposed Actions and Cost Estimates (2007-2016) for the Upper Snoqualmie River..... | 120 |
| Table 5-7 Lower Snoqualmie River Flows..... | 128 |
| Table 5-8 Proposed Actions and Cost Estimates (2007-2016) for the Lower Snoqualmie River..... | 136 |
| Table 5-9 Tolt River Flows..... | 147 |
| Table 5-10 Proposed Actions and Cost Estimates (2007-2016) for the Tolt River..... | 158 |
| Table 5-11 Raging River Flows..... | 162 |
| Table 5-12 Proposed Actions and Cost Estimates (2007-2016) for the Raging River..... | 169 |
| Table 5-13 Sammamish River Flows..... | 180 |
| Table 5-14 Proposed Actions and Cost Estimates (2007-2016) for the Sammamish River..... | 185 |
| Table 5-15 Cedar River Flows..... | 195 |

LIST OF TABLES

| | Page Number |
|--|-------------|
| Table 3-1 Land and Structures Located in Mapped 100-Year Floodplains in King County..... | 27 |
| Table 3-2 2005 Repetitive Loss Properties In King County, WA..... | 28 |
| Table 3-3 Federally Declared Flood Disasters In King County (1990 to 2006): Damage To Publicly Owned Property..... | 30 |
| Table 3-4 Federally Declared Flood Disasters In King County (1990 to 2006): Local, State and Federal Cost Share to Repair Damaged Public Property..... | 30 |
| Table 4-1 Flood Studies Completed by King County Since 1993..... | 41 |
| Table 4-2 Flood Hazard Corridor Working Map Reaches and Data Availability for King County Rivers..... | 49 |
| Table 5-1 Proposed Countywide Programs and Costs (2007-2016)..... | 95 |
| Table 5-2 Proposed Countywide Projects and Costs (2007-2016)..... | 97 |
| Table 5-3 South Fork Skykomish River Flows..... | 100 |
| Table 5-4 Proposed Actions and Cost Estimates (2007-2016) for South Fork Skykomish River in King County..... | 106 |
| Table 5-5 Upper Snoqualmie River Flows..... | 114 |
| Table 5-6 Proposed Actions and Cost Estimates (2007-2016) for the Upper Snoqualmie River..... | 120 |
| Table 5-7 Lower Snoqualmie River Flows..... | 128 |
| Table 5-8 Proposed Actions and Cost Estimates (2007-2016) for the Lower Snoqualmie River..... | 136 |
| Table 5-9 Tolt River Flows..... | 147 |
| Table 5-10 Proposed Actions and Cost Estimates (2007-2016) for the Tolt River..... | 158 |
| Table 5-11 Raging River Flows..... | 162 |
| Table 5-12 Proposed Actions and Cost Estimates (2007-2016) for the Raging River..... | 169 |
| Table 5-13 Sammamish River Flows..... | 180 |
| Table 5-14 Proposed Actions and Cost Estimates (2007-2016) for the Sammamish River..... | 185 |
| Table 5-15 Cedar River Flows..... | 195 |

LIST OF FIGURES

| | Page Number |
|--|-------------|
| Figure 3-1 Breakdown of King County Community Rating System Credit..... | 34 |
| Figure 4-1 FEMA Floodplain and Floodway..... | 38 |
| Figure 4-2 King County Zero-Rise Floodplain and Floodway..... | 38 |
| Figure 4-3 Channel Migration Impacts on Properties Outside the Floodplain..... | 44 |
| Figure 4-4 Green River Channel Migration Zone Hazard Map (Excerpt)..... | 46 |
| Figure 4-5 Flood Hazard Management Corridor..... | 50 |
| Figure 4-6 A Sediment Monitoring Program and Its Components..... | 65 |
| Figure 4-7 Capital Improvement Projects Built or Maintained by King County for Flood Control..... | 69 |
| Figure 4-8 Containment and Training Levees..... | 70 |
| Figure 4-9 Log Structures..... | 74 |
| Figure 4-10 Levee Setback Projects..... | 78 |
| Figure 4-11 Larger Easement Area Needed for Major Levee Repairs..... | 81 |
| Figure 4-12 King County Flood Warning Phase Threshold and Flood Peak Summary..... | 88 |
| Figure 7-1 Authorized Levies Under One-Percent Limit..... | 322 |

